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AUTHOR Wang, Lin
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ABSTRACT

The Differential Aptitude Test (DAT) is a multiple aptitude battery designed to measure junior and senior high school students' and adults' ability to learn or succeed in certain areas. The test is suitable for group administration and is primarily for use in educational and vocational counseling, although it may be used in employee selection. The DAT contains two levels, with two equivalent alternate forms for each level. Eight subtests measure abilities. A score is provided for each subtest as well as for scholastic aptitude. Test administration procedures are easy to follow, and test materials are durable and reusable. The norming process for the edition was impressive, with about 170,000 students in the standardization samples. Evidence for reliability and validity is reviewed. The fact that the DAT has remained one of the most frequently used batteries is a tribute to its quality, credibility, and utility. The new items and new norming data of the most recent edition have improved the test while preserving psychometric quality. It would be worth pursuing concurrent validity data on the DAT in a few broadly defined occupational areas. (SLD)

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The Differential Aptitude Test: A Review and Critique

Lin Wang

Department of Educational Psychology

College of Education

Texas A&M University

College Station, TX 77843

Paper presented at the annual meeting of

the Southwest Educational Research Association

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Title: Differential Aptitude Tests, (5th ed., Levels 1 & 2, Forms C & D)
Authors: G. K. Bennett, H. G. Seashore, A. G. Wesman
Publisher : The Psychological Corporation (Harcourt Brace Jovanovich)
Date of publication: 1990
Administration time: About 3 hours.
Selected costs (as of December 7, 1992):

1. DAT with Career Interest Inventory Examination Kit (one booklet and answer document for each level, Directions for administering, Practice test and Directions for administering practice test, PSA Part I answer sheet) --$ 20.00.
2. Norms booklet (Fall or Spring) $20.00. Technical manual $ 20.00.
3. Scoring and reporting cost: $ 1.50 for scoring each answer document. Individual report--1st copy $ .53, each additional $ .15. Summary of group (by teacher/counselor) -- 1st copy $ .24, each additional set $ 17.00.

Brief Description of Purpose and Nature of Test

The Differential Aptitude Tests (DAT) is a multiple aptitude battery, designed to measure students' (junior and high school) and adults' ability to learn or to succeed in certain areas. The test is suitable for group administration and is primarily for use in educational and vocational counseling; however it may also be used in selection of employees. It was first published in 1947 and revised in 1962, 1972, 1980 and 1990. The extensively revised 1990 edition now features two levels, completely new items and reduced testing time. Two equivalent alternate forms (C and D) are available for each level (Level 1 for Grades 7-9, Level 2 for Grades 10-12). The readability level of the directions in the tests is at Grade 5.

Verbal reasoning (VR), numerical reasoning (NR), abstract reasoning (AR), perceptual speed and accuracy (PSA), mechanical reasoning (MR), space relations (SR), spelling (Sp) and language usage (LU) are the abilities measured by eight subtests respectively. Nine scores are provided, one for each subtest, and an additional one, the scholastic aptitude score (SA). The SA score is from VR and NR (VR + NR) and measures one's ability to learn at school. Converted norm-referenced

scores are reported in percentile ranks, stanines and scaled scores. A Normal Curve Equivalents (NCEs) score is available for research purpose. Both separate-sex norms and combined-sex norms are presented in the norms booklet. All the test items in this edition except PSA are multiple choice. In MR, problems are presented using drawings.

Practical Evaluation

Compared with Forms V and W of the 1980 edition, the physical appearance of the materials of this edition has been considerably improved . The paper used is of better quality, and front covers of all the materials share the same pleasant design, but take on individual color and patterns. All the materials are quite durable and reusable.

The test administration procedures are easy to follow as they are well standardized. No special training is needed for administering the tests, but test supervisors and proctors are strongly advised to become thoroughly familiar with the procedures to ensure accurate and reliable test results. Written instructions are given to test supervisors for what to say and what to do in each subtest. A separate sample test is available for test-takers to acquaint themselves with the test beforehand. This will help some people reduce test anxiety level due to unfamiliar materials. Three types of answer documents are available for different scoring needs; users may choose to score the tests by hand, by scanner or have them scored by the Psychological Corporation, which offers a variety of reporting service. In general, this reviewer thinks that the test contents are appropriate in view of the purposes of the DAT; the illustrations are clear and meaningful, and the editorial quality of the test materials is satisfactory.

Technical Evaluation

Both a Fall and Spring Norms Booklet is available (over 200 pages each). With percentile ranks, stanines and scaled scores, it is convenient to compare the differences

between two raw scores and gain meaningful interpretation. Scaled sores are a new feature of this edition. It has two advantages; one is the possibility to compare test scores across different levels and forms, the other is the sample-free conversion of raw scores to scaled scores at a given level or form. However, scaled scores should not be used to compare scores among different subtests (Bennett, 1992). Norms are also provided for equating scores on Forms V and W (1980 edition) to scores on Forms C and D. One problem with earlier editions was that no normative data were given for ethnicity subpopulations (Pennock-Roman, 1984). This problem remains in this edition. Considering that non-white students comprised 27% of the norming population for this edition, norms for ethnicity subpopulations would not only reveal whether the tests favor some particular subpopulations, but also help counselors better understand their clients' performance.

The norming process for this edition was impressive. Several phases of research were involved. Because this revision contains completely new items, a national item tryout program was developed to determine the technical indices of the new items. About 84,000 students from over 150 school districts participated in the program. A stratified random sampling technique was used to make the sample representative of the student population in the U.S.A.. About 100,000 students from 520 districts, and another 70,000 students formed the Fall and Spring standardization samples respectively. The demographic composition of the samples were in proportion to that of the total U.S. school enrollment. Both the sample sizes and the sample composition are adequate, and the obtained norms are nationally applicable.

The internal consistency reliability coefficients were computed with the KR#20 formula for all the subtests except PSA, which is highly speeded and should not be assessed in the same way. The coefficients range from .82 to .95. This high internal

consistency points to the highly homogeneous domains sampled by the subtests (Anastasi, 1988). A more homogeneous subtest yields a more precise measurement on a criterion (one particular aptitude); the whole battery will then obtain more reliable results on multiple criteria (multiple aptitudes). For most of the subtests, the reliability coefficients are in the .80s. The coefficients for SA (VR+NR) are expectedly the highest, remaining above .90. The MR scale has the lowest coefficients across levels, forms and sexes, with females consistently lower. Alternate forms reliability coefficients range from .73 to .90 with a median of .83. Since this is an index of equivalency and stability, it is safe to conclude that Forms C and D are reliable over time and form. The reliability of PSA was obtained with the alternate forms reliability, with coefficients ranging from .79 to .87. Standard error of measurement, mean and standard deviation of a subtest are also reported along with reliability coefficients. This information helps to provide a range for a true score and to construct a score profile.

As is mentioned by other reviewers (Anastasi,1988; Pennock-Roman,1984), validity data for previous versions of the DAT are abundant. The correlation coefficients among tests are in either the moderate (.50s to .60s) or the low (below .30) range. The lowest occur between PSA and other tests (.06 to .31). This is not surprising because PSA has little to do with students' learning at school. These intercorrelation coefficients show that the tests do measure different abilities. The moderate correlations among AR, MR, SR, Sp and LU suggest that these abilities are related to one another. Since the standardization population is junior and high school students, most of their abilities demonstrated through the DAT are related to school learning, therefore, these abilities are not likely to be markedly independent of one another.

Forms C and D replace Forms V and W of the previous edition respectively. The correlation coefficients between C, D and V, W are in the .70s and .80s with a median of

.78. These moderately high coefficients confirm that , on the one hand, the Forms C and D consistently measure the same abilities as did Forms V and W , on the other, Forms C and D are not a simple duplication of Forms V and W.

The DAT has been correlated with several well-known tests for aptitude (ACT, ASVAB, PSAT, SAY) and achievement (CAT, CTBS, etc.) and with cumulative GPA. Such a comparison provides criterion-related validity information. Most tests have moderate to high correlation with GPAs and achievement tests (.40s to .80s for VR, NR and SA). The PSA and MR scales correlate the lowest with GPAs and achievement tests. It is reasonable to believe that there is a positive relationship between the DAT and achievement tests, and the DAT can serve as a good predictor of GPAs. The DAT correlates well with the ASVAB and Verbal, Math in the SAT, with coefficients in the .60s. The PSA and MR scales in the DAT measure similar abilities that are measured by MC (Mechanical & Crafts), BC (Business & Clerical) of the ASVAB. The correlation coefficients between PSA, MR and MC, BC are in the high .50s to .80s. This can be accepted as evidence for the construct validity of PSA and MR.

Reviewer Comments

The earlier editions of the DAT have been extensively reviewed (Anastasi, 1988; Cronbach, 1984; Penn-Roman, 1984; Sander, 1985; Hambleton, 1985). The reviewers have generally agreed on the psychometric quality and utility of the DAT and, at the same time, pointed out some problems such as obsolete illustrations, lack of ethnicity norm information, poor differential abilities, and unattractive physical appearance. However, the reviewers all highly recommend the DAT to users of psychological tests. For Forms C and D, regrettably, no other reviewers' comments are available.

Summary Evaluation

The fact that the DAT has remained one of the most frequently used batteries is a

tribute to its quality, credibility and utility. This reviewer shares the other reviewers' judgments on the previous editions of the DAT, and is encouraged to note that Forms C and D have improved on previous editions. While preserving the same psychometric quality and the nature of the aptitudes to be measured, the completely new items and new norming data have updated the DAT for use in the 1990s. Quality control is evident in every phase of test development. Special efforts were made to guard against possible bias regarding sex, ethnicity, offensive words, etc.. This will make the DAT acceptable to diversified user populations, and the test results can better reflect test-takers' performance.

The validity data for the fifth edition once again demonstrate that the DAT can serve to predict academic performance. Expectancy tables for grades can be constructed from the DAT scores with large samples. As is the case with the earlier editions (Pennock-Roman, 1984), however, no information is available about the relationship between the DAT scores and achievement or performance other than academic learning. Because the DAT is also used for vocational counseling, both theoretical justification and empirical evidence is needed that confirms that the tests measure the aptitudes typical of certain occupations. This reviewer believes that it is worthwhile to conduct research to acquire concurrent validity data on the DAT in a few broadly defined occupational areas. Compared with the standardization process, these validity studies would not cost nearly as much, but would add greatly to the utility of the DAT.

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